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Effects of Loma Prieta Earthquake on Navy Members and Families

Elyse W. Kerce
Gerry Wilcove

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Navy members and spouses who were present in the San Francisco Bay Area when the October 1989 Loma Prieta Earthquake occurred were surveyed to examine utilization and effectiveness of support services available to them after the earthquake; and to assess the extent of psychological, behavioral and physical symptoms experienced following the disaster. Disaster-related effects on performance and morale of area commands were investigated. Survey data were supplemented by interviews with selected command leaders and service providers. Spouse respondents reported more symptoms, more needs, and more services used than military respondents. The principal need expressed by both military members and spouses was "some one to talk to." Thirty-nine percent of military respondents and 61 percent of spouse respondents reported experiencing stress-related psychological or physical symptoms. Difficulty sleeping and general anxiety were common symptoms. Spouses of deployed military members experienced more stress-related symptoms than other groups. Coping style was shown to have a significant effect on the number of symptoms reported and how long such symptoms lasted. Individuals who relied on informal sources of support suffered more stress-related symptoms than those who coped in other ways. The majority of military respondents did not feel that their own performance or morale was affected by the earthquake and command leaders generally concurred.

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FOREWORD

This report presents the results of an earthquake experiences survey conducted among Navy personnel and spouses who were in the San Francisco Bay Area during the 1989 Loma Prieta Earthquake. It is focused on the psychological effects of post-traumatic stress, rather than on the physical impact of the earthquake.

This effort has been funded under the Quick Response Program (Program Element 0603701N, Work Unit Number 63701N-R1771) and was requested by the Navy Family Support Program (PERS-66) and Commander, Naval Base San Francisco.

We wish to acknowledge the assistance of the staff at the Family Service Center, Treasure Island and the many volunteers who assisted in the distribution of survey materials.

JULES BORACK
Director, Personnel Systems

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SUMMARY

Problem

The effects of natural disasters are not limited to property damage but have psychological, behavioral, and physical effects on individuals. However, little is known about:

- Long-term effects.
- The cumulative impact of disaster-related stress in conjunction with the unique conditions of Navy life, such as family separation and the absence of enduring community ties.
- The effect of the disaster on organizational outcomes, via its impact on personnel.
- What can be done by the Navy to minimize post-traumatic stress effects on Navy families.

Objective

This effort was initiated to examine the utilization and effectiveness of services available to Navy members and their families in the area of the 1989 Loma Prieta Earthquake; and to assess the psychological, behavioral, and physical symptoms experienced as a result of the disaster. It was further intended to determine if the earthquake affected readiness of commands based in the earthquake area.

Approach

A survey questionnaire was developed and administered to members of Navy commands in the San Francisco Bay Area and to spouses residing in military housing at Naval Station, Treasure Island; Naval Air Station, Alameda; Naval Supply Center, Oakland; Hamilton Air force Base; and Point Mulati. Survey data were supplemented by interviews with selected command leaders and service providers. Respondents were asked to indicate their needs, assistance received, services utilized and service satisfaction, and the psychological and physical symptoms experienced by them and their family members following the earthquake. Military respondents were grouped by marital and parental status, spouse respondents by parental status and deployment status of their military spouse. Coping strategies were factor-analyzed and reduced to four coping styles. A prior stress index was computed by weighting stress-producing events in the individual's life over the previous year. The relationships among prior stress, coping style, family situation, and symptoms experienced were examined.

Findings

1. Spouses reported more symptoms and needs and utilized services more than military members.

2. Thirty-nine percent of the military respondents and 61 percent of the spouses reported experiencing some stress-related psychological or physical symptoms. Difficulty sleeping and general anxiety were the most common symptoms.

3. Services used most frequently were related to physical assistance, such as those provided by the Public Works Center (PWC), or the food and other necessities supplied by the command. Less than 10 percent of the respondents utilized the psychological services available to them.

4. The principal need expressed by both military members and spouses was "someone to talk to."

5. Among military members, those in the married and divorced/separated groups reported more symptoms at 2 weeks than did single individuals. Seven months after the earthquake, married members had fewer symptoms than single or divorced/separated members.

6. Spouses of military members who were deployed at the time of the earthquake reported experiencing more personal symptoms than spouses of members who were not deployed. Parental status did not affect the number of personal symptoms experienced.

7. The most frequent post-earthquake family problem reported by military members was that their spouses had become less supportive of a Navy career. Among spouses, the family problem reported most often was marital conflicts.

8. Coping style was shown to have a significant effect on the number of symptoms experienced. Individuals who sought support from informal sources (e.g., friends and extended family) were more likely to experience symptoms than individuals who employed other coping styles (i.e., support from formal sources, avoidance, or active/self-sufficient coping), and their symptoms were more likely to persist.

9. Spouse age was related to the number of personal symptoms, with the younger group more likely to experience stress-related symptoms. The number of children in the household was related to the number of children's symptoms reported by spouses.

10. The majority of military members did not feel that their own performance or morale was affected by the earthquake and command leaders who were interviewed generally concurred.

11. Military members and command leaders both perceived a minimal impact on unit readiness due to the earthquake; however, command leaders found that recall bills were frequently out-of-date and inadequate.

12. Provisions for communications between members at sea and dependents in the disaster area were frequently inadequate.

Discussion

Many respondents who experienced psychological and physical symptoms following the traumatic event of the earthquake did not seek or utilize the services available to them. However, those who did obtain assistance from formal sources (i.e., agencies, programs, counselors) reported fewer symptoms at 2 weeks and again at 7 months than those who utilized informal sources of support. When services were used, they were most likely to be related to physical assistance (emergency food or PWC), rather than to counseling services designed to assist members and their families in dealing with anxiety and other related symptoms. This suggests either an unawareness

of available services or an unwillingness to ask for help. Well-publicized disaster preparation programs should be initiated that address such topics as anticipated emotional reactions and where to obtain assistance, and special efforts should be made to reach high-risk groups.

In general, results from spouse and member surveys supported the conclusions of the service providers concerning the individuals most at risk for experiencing post-traumatic stress symptoms. For example, both data sources indicated that spouses and children of deployed members are likely to be particularly vulnerable. Also, younger spouses among the respondents experienced more stress-related symptoms and reported children's problems of longer duration following the earthquake than those in older age brackets.

Spouses of all ages reported feeling anxious when separated from family members and this anxiety was continuing after 7 months for 22 percent of the sample. This finding may underlie members' reports that their spouses had become less supportive of their Navy careers following the earthquake. The difficulties in communication between deployed members and their families may also be a contributing factor. Because of communications difficulties, spouses were frequently unable to discuss the situation with the military spouse and members were not able to ascertain the safety of their family. The ombudsman network has a vital role to play in facilitating such communications, but many ombudsmen have had no training in disaster-response procedures. Adding to communications problems was the fact that recall bills, meant to provide home address and telephone numbers for command members, were frequently out-of-date and inaccurate.

Recommendations

1. Develop and initiate disaster preparation education programs that address such topics as anticipated emotional reactions and where to obtain assistance.

2. Utilize out-reach strategies to reach those in high-risk populations.

3. Include provisions for helping children express their fears and anxieties in disaster response plans and educating their parents in the best ways to deal with children's fears and anxieties.

4. Provide command ombudsmen with recall bills that are kept up-to-date by commands.

5. Provide training in disaster response procedures for ombudsmen.

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INTRODUCTION

Problem

The effects of natural disasters are not limited to property damage but have psychological, behavioral, and physical effects on individuals. Disaster-related stresses may be greater for Navy personnel and their families due to unique aspects of Navy life, such as family separation and the absence of enduring community ties, and little is known about long-term effects. Considerably less is known about how such stress affects organizational outcomes or what can be done to minimize effects on Navy families.

Objectives

This effort was initiated to examine the utilization and effectiveness of services available to Navy members and their families in the area of the 1989 Loma Prieta earthquake; and to assess the psychological, behavioral, and physical symptoms experienced as a result of the disaster. It was further intended to determine how the earthquake affected readiness of commands based in the earthquake area.

Background

The Loma Prieta earthquake, with a magnitude of 7.1 on the Richter scale, struck on 17 October 1989, causing 62 known deaths, more than 3,000 injuries, and over $8 billion damage in Northern California. It has been speculated that casualties would have been greater except for a combination of fortuitous circumstances. The earthquake occurred shortly after 5:00 p.m. so that schools were closed and children were home. The early hour scheduled for commencement of the World Series baseball game meant that many commuters left work earlier than was normal and thousands of spectators had already made their way to the stadium where there was virtually no damage. In addition, weather conditions were optimum and there was minimum disruption of communications.

Within the military community, two deaths and two serious injuries were documented. Damage to naval shore installations geographically located within the area of responsibility assigned to the Commander, Naval Base San Francisco was approximately $175 million. Particularly hard hit were Naval Station Treasure Island and Naval Air Station Alameda due to liquefaction of sandy landfills. Damage to the Oakland Bay Bridge severely limited vehicular access to and from Naval Station Treasure Island.

Although the main shock of the earthquake lasted for a matter of seconds, aftershocks continued at frequent intervals for several days. An aftershock of 5.0 magnitude occurring 33 hours after the main shock exacerbated damages, particularly at Naval Air Station Alameda and Naval Station Treasure Island. After 21 days, 87 aftershocks of a magnitude of 3.0 or higher had been recorded.

Civilian medical authorities in the San Francisco Bay Area reported that 25,000 cases of Post-traumatic Stress Disorder were receiving counseling and assistance as of January 1990, and

Navy support staff estimated that significant numbers of military personnel and their families experienced both immediate trauma response reactions and delayed stress reactions.

The Navy Personnel Research and Development Center (NPRDC) was requested to investigate the psychological, behavioral, and physical effects of the Loma Prieta earthquake on Navy members and their families, and to assess the availability, utilization of, and satisfaction with support services provided.

APPROACH

Military and Spouse Samples

The military sample was drawn from commands based in the San Francisco Bay Area. Command participation in the study was solicited by administrative message from Commander, Naval Base (COMNAVBASE) San Francisco, directed to 16 of 20 commands in the area, asking the commands to provide a point of contact (POC) for survey administration. One of those commands had not been in the area during the earthquake; the remaining commands agreed to participate in the survey. Boxes of questionnaires were delivered to POCs for distribution to command members who were present in the area at the time of the earthquake. A total of 5,081 surveys were delivered to participating commands at their request. However, the number of questionnaires actually distributed to members was 4,432 because several of the commands had overestimated the number of their members who had been in the Bay Area during the earthquake. Another 272 were returned without being completed because they had been mistakenly distributed to recipients who had not been in the area at the time of the earthquake. Thus, a total of 4,160 individuals (4,432 minus 272) who had been in the Bay Area during the earthquake received surveys. Of these individuals, 2,544 returned surveys for a response rate of 61 percent. Survey results pertain to the sample of respondents obtained in the study and may or may not generalize to all military members in the Bay Area.

Spouse surveys were mailed to military housing areas at Naval Station (NAVSTA) Treasure Island, Naval Air Station (NAS) Alameda, Naval Supply Center (NSC) Oakland, Hamilton Air Force Base (AFB), and Point Mulati. These spouses lived in 3,749 of the 3,947 housing units in the area. Mailing labels were generated by the regional housing office and were directed to addresses rather than to individuals. A total of 212 surveys could not be delivered and were returned unopened because the unit in question had become vacant. Another 128 surveys were returned without being completed because the recipient had arrived in the Bay Area after the earthquake. Thus, 3,409 spouse surveys were mailed. A total of 793 were completed and returned, for a response rate of 23 percent. Survey results pertain to the sample of respondents obtained in the study and may or may generalize to all Navy spouses in the Bay Area.

Members of both the military and spouse samples were informed that a similar questionnaire might have been completed by his or her spouse and were encouraged to complete the questionnaire nevertheless.

Procedure

Because of administrative considerations, the survey could not be conducted until April 1990, approximately 7 months after the earthquake occurred. This was a disadvantage in that respondents had to rely on memory for describing their psychological and physical symptoms in the period immediately after the earthquake. On the other hand, the delay made it possible to assess stress symptoms of longer duration.

Surveys were shipped from NPRDC to the Family Service Center (FSC) at NAVSTA Treasure Island, where volunteers helped assemble the materials and prepare envelopes for mailing. FSC staff members also actively participated in contacting commands and arranging for delivery of survey materials.

Data collected through the survey were supplemented by interviews with leaders (either Commanding Officer or Executive Officer) of five commands based in the area and with 22 support services staff members. Interviews were conducted by NPRDC researchers approximately 8 months after the earthquake occurred.

Survey Instruments

A survey questionnaire was developed to assess the extent of psychological and physical symptoms experienced by Navy members and their families following the Loma Prieta earthquake. The questionnaire also solicited information about damages and injuries sustained, support services used, satisfaction with services, unmet needs, earthquake preparation, and demographic background. In addition, respondents were asked to provide a personal history of stressful life events in the preceding year and to indicate the coping strategies they employed following the earthquake. Military respondents were also asked how they thought their morale and performance, and that of their commands, had been affected by earthquake-related trauma.

Separate versions of the questionnaire were prepared for Navy military members and Navy spouses. If the individual receiving a questionnaire was not residing in the San Francisco area at the time of the earthquake, he or she was requested to write "No" across the face of the questionnaire and mail it back. Copies of the surveys are included as Appendix A.

Analysis

Responses received from the military and spouse samples were analyzed separately throughout. The majority of the items were included in both surveys and, for those items, descriptive summaries for the two samples are presented side-by-side. However, this is not intended to imply that the results are based on data received from married couples. The military sample was divided into analysis groups on the basis of marital and parental status, while spouse respondents were grouped by parental status and whether or not the member spouse was deployed when the earthquake occurred. Analysis of variance procedures were used to investigate whether reports of psychological and physical symptoms varied by analysis group.

Following the initial compilation of response frequencies and descriptive statistics, several summary variables were constructed for use in subsequent analyses. A prior stress index was

computed as a weighted sum of stressful life events in the previous year. Events and the weights assigned to them were adapted from the Holmes and Rahe (1967) Life Stress Scale. This index was used in a subsequent multiple regression analysis to help determine if prior events were related to the ways in which individuals reacted to the emotional stress of the earthquake.

Coping strategies selected by respondents from a list of 17 possibilities were entered into a factor analysis to determine if they could be reduced to a smaller number of factors or coping styles. A four-factor solution was found to account for 42 percent of the variance in coping strategies for the military respondents and 36 percent of the variance among spouse respondents. Results of the factor analysis are included in Appendix B, Tables B-1 and B-2. The resulting factors have been labeled Style 1: Support from Formal Sources, Style 2: Active/Self-sufficient Coping, Style 3: Support from Informal Sources, and Style 4: Avoidance.

Table 1 is provided as an outline of the variables used in analyses presented in the following sections.

Table 1

Summary of Variables Used in Analysis

Independent Variables	Dependent Variables
Demographics:	Personal symptoms at 2 weeks
Age	Personal symptoms at 7 months
Education	
Gender	Family problems at 2 weeks
Race	Family problems at 7 months
Marital status	
Number of children	Children's symptoms at 2 weeks
Housing area	Children's symptoms at 7 months
Paygrade	
Deployment Status	Military Sample Only
Earthquake injury (to self and family)	Earthquake-related absenteeism
Earthquake damage sustained	Effects on morale (self and command)
Earthquake disruption of services	Effects on performance (self and command)
Availability of support services	
Support services used	
Satisfaction with support services	
Post-earthquake communication	
Time stationed in Bay Area	
Presence of relatives in Bay Area	
Intimacy of normal social interactions	
Family needs following earthquake	
Assistance with needs	
Coping style	
Number of coping strategies used	
Prior stress events	
Earthquake preparation	
Crisis training	

RESULTS

Description of Respondents

Military Respondents

Eighty-three percent of the military respondents were male, ranging in age from 17 to 58 with an average age of 28 years. The enlisted/officer distribution was 89 percent and 11 percent, respectively, with 60 percent of the total military sample in paygrades E-4 through E-6. More than half (57 percent) were currently assigned to sea duty, and 20 percent reported that they were deployed when the earthquake occurred.

Table 2 shows the distribution of the military sample by marital and parental status. Among married respondents, approximately 9 percent had a military spouse. Approximately 42 percent of the sample were parents, with a total of 2,029 children among them.

Table 2

Distribution of Military Sample by Marital and Parental Groups

Group	Percent of Sample
Single, no children	38.8
Single, with children	2.7
Married, no children	16.4
Married, with children	36.1
Divorced/separated/widowed, no children	2.9
Divorced/separated/widowed, with children	3.0

Almost two-thirds of the military respondents lived off-base in civilian housing, as contrasted with spouse respondents, all of whom lived in military housing

Spouse Respondents

Although this sample was composed primarily of women, 15 percent of the respondents were male, and 20 percent were themselves military personnel. Spouses ranged in age from 18 to 55, with an average age of 32. Thirty-one percent reported that the military member in the household was deployed at the time of the earthquake. Table 3 shows the distribution of the spouse sample by parental status and deployment of military spouse. As the table indicates, 85 percent of the spouses responding were parents, with a collective total of 1,435 children. Sixty-nine percent of their children were under the age of 11.

Table 3

Distribution of Spouse Sample by Parental Groups and Deployment Status

Group	Percent of Sample
No children, member not deployed	10.1
No children, member deployed	4.6
Children, member not deployed	58.8
Children, member deployed	26.5

Earthquake Injuries and Damages

Respondents were asked to report on both major injuries and those they considered to be minor, and on both major and minor damage to their residences or personal property. Injuries were almost entirely minor, with only three injuries that were considered "major"reported by the military sample, and one reported by the spouse sample. The summary presented in Table 4 represents all reported injuries or damage, regardless of severity.

Table 4

Percent Reporting Earthquake Injury or Damage

	Spouse Respondents (N = 793) (%)	Militay Respondents (N = 2,544) (%)
Injury to self or family member	17	1
Damage to residence or personal property	51	34

Disruption of Transportation and Utility Services

Transportation throughout the Bay Area was affected by earthquake damage to bridges and roads. Survey respondents were asked if the normal mode of transportation for themselves or their spouses had been disrupted. Forty-three percent of the military sample and 54 percent of the spouse sample responded affirmatively.

The loss of utilities was reported by respondents from each of the naval housing communities in the area. Commands sought to minimize the hardships associated with utility service disruptions by bringing in mobile support equipment, such as electric generators, potable water containers, and portable showers. Table B-3 summarizes the extent of disruption by housing area, as reported by military and spouse respondents (see Appendix B.)

Communication

Overall, 32 percent of member respondents and 73 percent of spouse respondents were able to determine that their family members were safe within the first hour after the earthquake. However, among members who were deployed at the time of the earthquake, 46 percent stated that more than 36 hours elapsed before they were able to establish communications with their families in the affected area. Fifty-six percent of spouses of deployed members stated that more than 36 hours elapsed before communication was established. Ombudsmen from area commands played a major role in communications efforts, but were frequently hampered by having out-of-date information.

Utilization and Satisfaction with Support Services

Respondents were presented with a list of 19 support services and asked to indicate if the service was available, if they had used that service, and how satisfied they were with each service used. In general, spouses tended to report higher utilization than did the military sample; however, even among spouses, a relatively small percentage reported using any individual service. Fifty-four percent of spouse respondents and 81 percent of military respondents indicated that they did not use any services. Among military respondents, utilization was not significantly different between those who were and were not deployed when the earthquake occurred.

Table 5 summarizes responses from both samples regarding the use of services, the perceived non-availability of services, and mean satisfaction scores for services used. As the table indicates, utilization as reported by spouses tended to be higher for each of the services than utilization reported by the military sample. Services used most frequently by both groups were emergency food and supply services, the ombudsman network, Base Security, and the Public Works Center. Despite the fact that the provision of emergency food and supplies was one of the services used most frequently, it was also reported as one that was frequently unavailable. Rap workshops for family members and structured activities for school-aged children were other services frequently perceived to be unavailable.

Unmet Needs of Navy Members and Spouses

To determine if the services provided in the post-earthquake period were relevant to the needs expressed by members and spouses, respondents were presented with a list of 10 needs and asked to select those applicable to them or their family. They were further instructed to indicate if assistance had been obtained in meeting those needs. The need expressed most frequently was "someone to talk to," which was indicated by 33 percent of the spouse sample and 14 percent of the military sample. Other needs and the percentages of individuals that reported them are presented in Table 6 for both samples.

Table 5

Utilization, Non-availability, and Mean Satisfaction with Support Services

Support Service	Military Respondents			Spouse Respondents		
	% Used	% Not Avail.	Mean Satis.*	% Used	% Not Avail.	Mean Satis.*
Rap workshops for family members	2	7	2.89	2	8	3.05
Emergency food/supplies from command	7	6	3.21	22	6	3.56
FSC information and referral	4	3	3.19	11	1	3.14
Red Cross	6	2	3.27	7	1	2.77
FSC counseling services	2	2	3.19	4	1	2.85
Federal Emergency Management Agency	2	3	3.00	1	2	3.00
Navy Relief	2	2	3.14	2	1	3.15
Structured activities for children	2	4	3.08	5	5	3.55
Emergency supplies from other sources	4	3	3.26	11	3	3.52
Chaplains	3	2	3.28	4	1	3.24
Church relief agencies	2	2	3.10	1	2	3.31
Psychological services from other commands	1	3	3.03	3	1	3.21
Ombudsman network	7	2	3.15	17	2	3.06
Stress management workshops	2	3	3.04	2	3	2.91
City agencies	2	3	3.06	1	2	3.07
County agencies	2	2	3.02	1	2	3.00
Base security	7	2	3.27	15	0	3.33
Fire department	5	2	3.43	10	0	3.56
Public Works Center	10	2	3.15	20	1	3.18

*Means were computed on a 4-point scale where 4 = very satisfied, 1 = very dissatisfied.

Table 6

Post-earthquake Needs Expressed by Military and Spouse Respondents and Percent Obtaining Assistance

Need	Military Respondents (N = 2544)		Spouse Respondents (N = 793)	
	Expressed Need (%)	Obtained Assistance (%)	Expressed Need (%)	Obtained Assistance (%)
Someone to talk to	14	12	33	22
Assistance with cleaning up damage at home	3	2	6	4
Assistance with home repair	4	3	10	8
Transportation assistance	7	5	16	12
Assistance in communicating with spouse	6	3	17	8
Child care	2	1	8	4
Therapy for children	1	1	5	2
Temporary financial assistance	2	1	3	1
Personal counseling	2	1	6	2
Family or marital counseling	1	1	3	1

The table also indicates the percentage who obtained assistance in dealing with a particular need. In each case, the percentage who obtained assistance was lower than the number expressing a need. These data do not necessarily indicate that assistance was not available, but only that assistance was not obtained. For example, of the 90 spouses who expressed a need for "someone to talk to" in the post-earthquake period and who did not obtain assistance, 65 indicated they did not attend the rap groups conducted, but only 17 of those said that such rap groups were not available. Similarly, 78 percent of that group did not use FSC counseling services, but only two said that such services were not available.

Psychological and Physical Symptoms

Military Respondents

Thirty-nine percent of the military respondents reported that, during the first 2 weeks after the earthquake, they experienced psychological and physical symptoms listed in the questionnaire. Seven months after the earthquake, the number of military respondents who reported that they were experiencing any of the symptoms had dropped to 11 percent.

Analysis of variance revealed that the number of symptoms experienced was related to marital status ($F2,2444 = 12.47$, $p = .000$) and deployment status at the time of the earthquake ($F1,2444 = 28.70$, $p = .000$). Married respondents reported significantly ($t2509 = -3.33$, $p = .001$) more symptoms at 2 weeks than did single members or divorced/separated members. Those who were deployed in October 1989 when the earthquake occurred reported fewer symptoms than those who were in the Bay Area at that time ($t2486 = 5.67$, $p = .000$). Parental status was not related to the number of personal symptoms reported by members. Refer to Appendix B, Table B-4 for a summary of this analysis.

By 7 months after the earthquake, neither marital nor parental status was associated with the number of personal symptoms experienced by military respondents. However, those who had been deployed during the earthquake continued to experience fewer symptoms ($t2486 = 4.14$, $p = .000$).

Individuals reporting 15 or more symptoms at 2 weeks were distributed among all the marital groups. At 7 months after the earthquake, nearly half of those reporting 15 or more symptoms were single respondents.

Spouse Respondents

Seventy-one percent of the spouse respondents reported that they experienced psychological and physical symptoms listed in the questionnaire during the first 2 weeks following the earthquake. After seven months, the number of spouses reporting symptoms had dropped to 43 percent.

A two-way analysis of variance was conducted to provide an overall test of group differences in the number of symptoms reported. Deployment of the military spouse was associated with the number of symptoms ($F1,771 = 32.49$, $p = .000$), but parental status was not. Among spouses, those whose military marital partner was deployed experienced more symptoms ($t773 = -5.70$, $p = .000$) than those whose partner was not deployed. Similar effects were found for both time periods. Details of this analysis are presented in a summary table in Appendix B, Table B-5.

Approximately 5 percent of the sample reported that they were experiencing more than 15 psychological and physical symptoms 2 weeks following the earthquake. Investigation revealed that 81 percent of this small, but extreme, group were parents. There was a positive correlation between the number of children and the number of symptoms experienced. However, coefficients (although significant at $p < .05$) were not large enough to be of practical value.

Symptoms Reported with Greatest Frequency

During the first 2 week ends following the earthquake, the symptom reported with greatest frequency by both military respondents and spouses was difficulty falling asleep, and sleeping through the night was also a problem frequently reported. Forty-one percent of the spouses experienced anxiety when separated from family members, a symptom which, for 21 percent of the sample, persisted over the next 7 months. Refer to Table 7 for the frequency with which all symptoms were experienced. Percentages for individual symptoms were considerably higher among the spouse respondents than among military respondents.

Table 7

Percent of Military and Spouse Respondents Reporting Various Psychological and Physical Symptoms

Symptom	Military Responsents (N = 2,544)		Spouse Respondents (N = 793)	
	At 2 Weeks (%)	At 7 Months (%)	At 2 Weeks (%)	At 7 Months (%)
Difficulty falling asleep	17	4	49	11
Difficulty sleeping through night	15	4	40	14
Anxious when separated from family	14	7	41	22
Fearful of returning to certain places	11	5	31	15
Feeling anxious all the time	10	3	35	14
Feeling threatened by forces beyond control	9	4	25	15
Difficulty concentrating	9	3	24	6
Not knowing what to do next	7	3	19	6
Short-tempered at work	7	4	6	2
Excessive fatigue	6	3	17	4
Trouble remembering things	5	3	14	7
Feeling guilty because others lost more	5	1	11	2
Loss of appetite	4	1	13	13
Nightmares	4	2	13	7
Nervous laughter	4	1	8	1
Short-tempered with family	4	2	16	5
Feeling angry much of the time	4	2	6	3
Decreased sexual desire	3	1	7	3
Shunning other people	3	2	5	3
Weight loss	3	1	6	2
Feeling numb, unable to relate	3	2	11	1
Feeling lethargic or apathetic	3	2	9	4
Crying for no reason at all	2	1	16	3
Large weight gain	2	2	2	3
Digestive problems	2	1	5	2
Feeling punished for something you didn't do	2	1	2	1
Feeling that you don't trust others	2	2	1	2

Children's Symptoms and Problem Behaviors

Spouse respondents whose marital partner was deployed at the time of the earthquake reported significantly ($p < .01$) more problem behaviors among their children 2 weeks after the earthquake than did spouses whose marital partner had not been deployed. Furthermore, this same group continued to report more children's problems after 7 months.

Military respondents generally reported fewer children's problems than spouse respondents. Among military members, the number of children's problem behaviors did not vary by marital status (i.e., single parents did not report significantly more problems than married parents). The frequency with which children's symptoms were reported by each of the samples is provided in Table 8.

Table 8

Percent of Military and Spouse Respondents Reporting Specific Children's Symptoms

Symptom	Military Respondents (N = 1.068)		Spouse Respondents (N = 674)	
	At 2 Weeks (%)	At 7 Months (%)	At 2 Weeks (%)	At 7 Months (%)
Refusing to sleep in own bed	17	5	29	10
Difficulty sleeping	9	2	19	6
Frequent nightmares	9	2	19	5
Physical complaints	4	2	14	6
Refusing to leave caretaker	4	1	13	2
Crying	4	1	12	2
Refusing to go to school	2	1	8	2
Aggressive behaviors	2	1	7	5
Bed-wetting	2	1	6	2
Eating problems	2	1	5	1
Poor school performance	1	1	6	3
Tantrums	1	1	5	3
Withdrawn, passive	1	1	4	1
Difficulty getting along with family	1	1	4	3
Thumb sucking	1	1	3	2
Difficulty getting along with friends	1	1	3	1
Frequent illnesses	1	1	2	2

Note. Frequencies have been rounded to nearest percent.

Personal and Children's Symptoms by Housing Area

Results from an analysis of symptoms by housing area appear to be consistent with the amount of damage and disruption of services which occurred at the two locations. For example, military respondents living in military housing on Treasure Island reported the greatest number of personal symptoms at 2 weeks, and again at 7 months; while those living in military housing at Hamilton AFB (where less damage was sustained) reported the fewest symptoms. Spouse respondents living on Treasure Island also reported a greater number of personal symptoms than spouses living in other military housing areas.

According to responses of military respondents, children in housing on Treasure Island also experienced more symptoms than children in other housing areas. Children of military respondents living in civilian housing had the fewest number of symptoms reported. Among the spouse respondents, those living in military housing at NAS Alameda reported more symptoms among their children, at both points in time, than did spouses living in other military housing areas. Spouse questionnaires were not mailed to civilian housing.

Family Problems

Single Navy members without children were excluded from the analysis of family problems. Percentages of military and spouse respondents reporting each of the family problems listed in the questionnaire are shown in Table 9. Among spouses, the family problem reported most frequently was an increase in marital conflicts; among military respondents, it was their perception that their spouses had become less supportive of a Navy career.

Coping Behaviors

Coping styles appeared to be relevant to an understanding of post-traumatic stress symptoms among both samples. Respondents were grouped according to their factor scores, and the coping styles adopted by military and spouse respondents in each marital and/or parental status group are also shown in Appendix B, Table B-6.

Military Respondents

The coping style employed by the largest number (37%) of military respondents was Style 1--Support from Formal Sources. People who cope in this manner are most likely to turn to professional service providers for assistance. The avoidance style of coping with earthquake stress was more likely to be used by respondents in the youngest age categories. This coping style involves "partying with friends" and "adopting a fatalistic attitude."

A two-factor analysis of variance procedure examined differences in personal stress symptoms reported by the military respondents at 2 weeks and 7 months. This analysis revealed that both the coping style ($F_{3,2480} = 95.69$, $p = .000$) and respondents' marital/parental status ($F_{5,2480} = 2.71$, $p = .019$) made a significant contribution to the variance in stress symptoms reported at 2 weeks. Military respondents who utilized formal sources of support reported the fewest personal problems, while those who utilized informal sources of support reported the most personal problems. After 7 months, coping style continued to account for a significant

portion of the variance in the number of personal symptoms experienced ($F3,2480 = 25.06$, $p = .000$), but marital/parental status did not. Refer to Table B-7 in Appendix B for details of analysis of variance results pertaining to the coping behaviors of military respondents.

Table 9

Percent of Military and Spouse Respondents Reporting Specific Family Problems

Symptom	Military Respondents (N = 1,468)		Spouse Respondents (N = 793)	
	At 2 Weeks (%)	At 7 Months (%)	At 2 Weeks (%)	At 7 Months (%)
Spouse less supportive of Navy career	9	5	8	6
Family member has emotional problems	7	3	8	3
Increase in marital conflicts between husband and wife	5	3	9	4
Increased arguments between children and parents	3	1	7	3
Increased arguments among siblings	1	1	7	3
An increase in the number of problems or issues that don't get resolved	2	1	4	3
Increased difficulty with sexual relationship between husband and wife	1	1	4	3
A family member appears to depend on alcohol or drugs	1	1	2	0
Physical and/or psychological violence in the home	1	1	1	1

Note. Frequencies have been rounded to nearest percent.

Excluding single military members, a similar analysis was conducted with family problems as the dependent variable. This analysis indicated that coping style also accounted for a significant amount of variance in the number of family problems experienced at 2 weeks and at 7 months. Details are provided in Table B-9, Appendix B.

Spouse Respondents

The coping style employed by the largest number (31%) of spouse respondents was an active/self-sufficient style that included making preparations for future earthquakes, helping others with earthquake damage, and talking within the family about the earthquake.

Analysis of variance procedures indicated that for spouses, as well as military respondents, the style used to cope with the earthquake trauma was associated with the number of personal symptoms. At 2 weeks after the earthquake, both coping style and the parental/deployment group contributed significantly to the variance in stress symptoms ($p = .000$), and the interaction of the two factors was significant at $p = .02$. At 7 months, neither the parental/deployment factor nor the interaction accounted for significant portions of the variance in personal symptoms of spouses. Details of these analyses are found in Table B-8 in Appendix B. Spouse respondents who indicated that their coping styles were based on support from informal sources had more personal problems at both points in time than those who employed other coping styles.

Coping style was also related to the number of family problems experienced at two weeks by the spouse respondents. As with personal problems, the group who reported the greatest number of family problems at two weeks were those whose coping style was support from informal sources. Coping style was not related to the number of family problems reported at seven months. Details of this analysis are provided in Table B-10, Appendix B.

Prior Stress Index

A prior stress index was constructed that represented the weighted sum of an individual's stress-producing events in the preceding year as reported by respondents and statistically transformed to approximate a normal distribution. It was hypothesized that stress would be cumulative and that there would be a positive relationship between prior stress and the number of symptoms experienced following the earthquake. Although this relationship was found to exist for both military and spouse respondents, prior stress accounted for only a small percentage of the variance in symptoms reported. The correlations between prior stress and each of the outcome variables are shown in Table 10.

Stress index means were not significantly different for the military and spouse samples. Among military respondents, single parents and divorced/separated groups with and without children reported higher prior stress levels than did the married groups or singles without children ($p = .01$). Among spouse respondents, there were no stress-index differences associated with parental status or deployment of the military spouse.

Predicting Post-traumatic Stress Symptoms

A series of stepwise multiple regressions were performed primarily to investigate whether post-traumatic symptoms could be predicted on the basis of marital/parental status (dichotomized) or other demographic variables. Analyses were conducted for each of six dependent variables: the total number of (1) personal psychological and physical symptoms, (2) children's problems, and (3) family problems at 2 weeks and 7 months following the earthquake. All dependent variables were transformed to approximate normal distributions. Groups of variables entered into the regression as predictors included demographics, prior stress, time in the area, relatives in the area, deployment, typical social interactions, earthquake damage and injury, and coping strategies. The criterion for entry was a probability of F to enter of .05.

Table 10

Correlations Between a Prior Stress Index and Personal Symptoms, Family Problems, and Children's Symptoms

	Prior Stress	
	Military Respondents (N = 2,544)	Spouse Respondents (N = 789)
Personal symptoms at 2 weeks	.26 (p = .000) (n = 2544)	.14 (p = .000) (n = 789)
Personal symptoms at 7 months	.21 (p = .000) (n = 2544)	.17 (p = .000) (n = 789)
Family problems at 2 weeks	.18 (p = .000) (n = 1536)	.18 (p = .000) (n = 789)
Family problems at 7 months	.22 (p = .000) (n = 1536)	.16 (p=.000) (n = 789)
Children's symptoms at 2 weeks	.12 (p = .000) (n = 1068)	.05 (p = .117) (n = 670)
Children's symptoms at 7 months	.08 (p = .006) (n = 1068)	.16 (p = .000) (n = 670)

Notes
1. Zero-order Pearson product moment correlations.
2. Distributions for prior stress, personal symptoms, family problems, and childrens' symptoms have been corrected to approximate normal distributions.

Overall, the best predictors of stress symptoms were the number of coping strategies used, the prior stress index, and earthquake damage and/or injury. Among demographic variables, the most useful for predicting stress symptoms in these samples was respondents' age. Age was negatively correlated with each of the stress measures (personal, family, and children's at 2 weeks and 7 months) in the spouse sample. The variable "social interaction", which enters into the regressions for several of the dependent variables for both the military and spouse samples, was derived from the survey item that is concerned with the intimacy of typical social interactions.

Military Respondents

For the military sample, multiple Rs ranged from .30, for the prediction of family problems at 7 months; to .47, for the prediction of children's symptoms at 2 weeks. The results of these analyses are presented in Table 11. The singles group (i.e., never married, no children) was

excluded from the analysis of family problems and respondents without children were excluded from the analysis of children's problems. For each of the dependent variables, forced entry of additional sets of variables did not add appreciably to the amount of variance accounted for.

Table 11

Results of Multiple Regression Analyses to Predict Post-traumatic Stress Symptoms: Military Sample

Symptom Type	Predictor Variables	Mult R*	R^2	B
Personal symptoms				
at 2 weeks	Number of coping strategies	.38	.15	.42
	Prior stress index	.42	.17	.08
	Earthquake damage	.43	.19	.62
	Earthquake injury	.43	.19	.90
Personal symptoms				
at 7 months	Number coping strategies	.27	.07	.23
	Prior stress index	.31	.10	.06
	Earthquake injury	.32	.10	1.11
	Age of member	.33	.11	-.02
	Earthquake damage	.34	.11	.34
Family problems				
at 2 weeks	Number coping strategies	.26	.07	.18
	Earthquake damage	.29	.09	.51
	Prior stress index	.32	.10	.05
	Earthquake injury	.33	.11	1.10
Family problems				
at 7 months	Prior stress index	.28	.08	.02
	Number coping strategies	.32	.10	.05
	Earthquake injury	.29	.08	.99
	Earthquake damage	.29	.09	.25
	Age of member	.30	.09	-.01
Children's symptoms				
at 2 weeks	Number coping strategies	.37	.14	.32
	Earthquake damage	.43	.18	1.00
	Number of children	.46	.21	.42
	Earthquake injury	.47	.22	1.30
Children's symptoms				
at 7 months	Number coping strategies	.22	.05	.13
	Earthquake damage	.26	.07	.38
	Number of children	.28	.08	.18
	Earthquake injury	.30	.09	.99
	Social interactions	.31	.09	.13

*All multiple Rs were significant ($p < .01$). Each successive predictor variable listed increased the multiple Rs significantly.

Notes.

1. Mult R = multiple R, R^2 = variance accounted for, B = slope.
2. Distributions for personal symptoms, family problems, and children's symptoms have been corrected to approximate normal distributions.

Spouse Respondents

For the spouse sample, the resulting multiple *R*s ranged from .30 for the prediction of family problems at 7 months, to .50 for the prediction of personal symptoms at 2 weeks. Respondents without children were excluded from the analysis of children's problems.

As with the military sample, for all dependent variables except family problems at 7 months, the number of coping strategies employed was the initial variable entered into the equations using a stepwise procedure. Deployment of the military spouse was a predictor of personal and family problems, but not of children's problems. The prior stress index and deployment of the military spouse also figured prominently. The number of children in the family contributed to the prediction of children's symptoms. Details of this analysis are provided in Table 12.

Earthquake Effects on Readiness, Morale, and Performance

Military members and command leaders were asked to report on three factors that might affect readiness: morale, performance, and absenteeism. Command leaders were also asked directly if they believed that the earthquake had affected command readiness.

Military Respondents

Despite transportation difficulties, 90 percent of the military members reported that they were not absent from duty on any day following the earthquake, and only 2 percent reported being absent for more than 3 days. In general, they believed that there was less effect on their own performance than on the performance of their command as a whole. The same type of pattern was found when morale was considered. In both cases, however, the majority of respondents thought that performance and morale remained "just about the same." Figure 1 shows the distribution of responses on the performance question and Figure 2 on the morale question.

Command Leaders

There was a general consensus among the command leaders interviewed that readiness was not diminished by events surrounding the earthquake; although, they did concede that some individuals were working with diminished effectiveness while attempting to deal with family problems. Command leaders' estimates of time lost was greater than that indicated by responses from Navy members. For example, at one command, only about 50 percent of command members were able to report for duty on the first day following the earthquake. Another reported that about 6 percent of their people had to go home on the first day to deal with emergencies. At several commands, the emergency situation revealed that command recall bills were sadly out-of-date.

Table 12

Results of Multiple Regression Analyses to Predict Post-traumatic Stress Symptoms: Spouse Sample

Symptom Type	Predictor Variables	Mult R*	R^2	B
Personal symptoms				
at 2 weeks	Number coping strategies	.42	.17	.49
	Earthquake damage	.44	.20	.92
	Military spouse deployed	.47	.22	.94
	Age of spouse	.48	.23	-.05
	Social Interactions	.49	.24	.33
	Prior stress index	.50	.25	.05
Personal symptoms				
at 7 months	Number coping strategies	.29	.09	.31
	Earthquake damage	.35	.12	1.03
	Prior stress index	.37	.14	.06
	Social interactions	.38	.15	.39
	Age of spouse	.40	.16	-.04
	Military spouse deployed	.41	.17	.60
Family problems				
at 2 weeks	Number coping strategies	.24	.06	.20
	Prior stress index	.30	.09	.08
	Earthquake damage	.33	.11	.59
	Military spouse deployed	.34	.11	.39
Family problems				
at 7 months	Prior stress index	.16	.03	.02
	Military spouse deployed	.21	.04	.22
	Parental category	.24	.06	.82
	Earthquake injury	.28	.08	.62
	Social interactions	.29	.09	.07
	Number of coping strategies	.30	.09	.03
Children's symptoms				
at 2 weeks	Number coping strategies	.33	.11	.35
	Number of children	.37	.13	.47
	Earthquake damage	.38	.15	.62
	Earthquake injury	.40	.16	1.46
Children's symptoms				
at 7 months	Number coping strategies	.22	.05	.14
	Prior stress index	.28	.08	.08
	Number of children	.32	.10	.35
	Earthquake injuries	.35	.12	1.52
	Earthquake damage	.37	.13	.47
	Age of spouse	.38	.14	-.03
	Time in Bay Area	.39	.15	.16

*All multiple Rs were significant ($p < .01$). Each successive predictor variable listed increased the multiple Rs significantly.

Notes.

1. Mult R = multiple R, R^2 = variance accounted for, B = slope.
2. Distributions for personal symptoms, family problems, and children's symptoms have been corrected to approximate normal distributions.

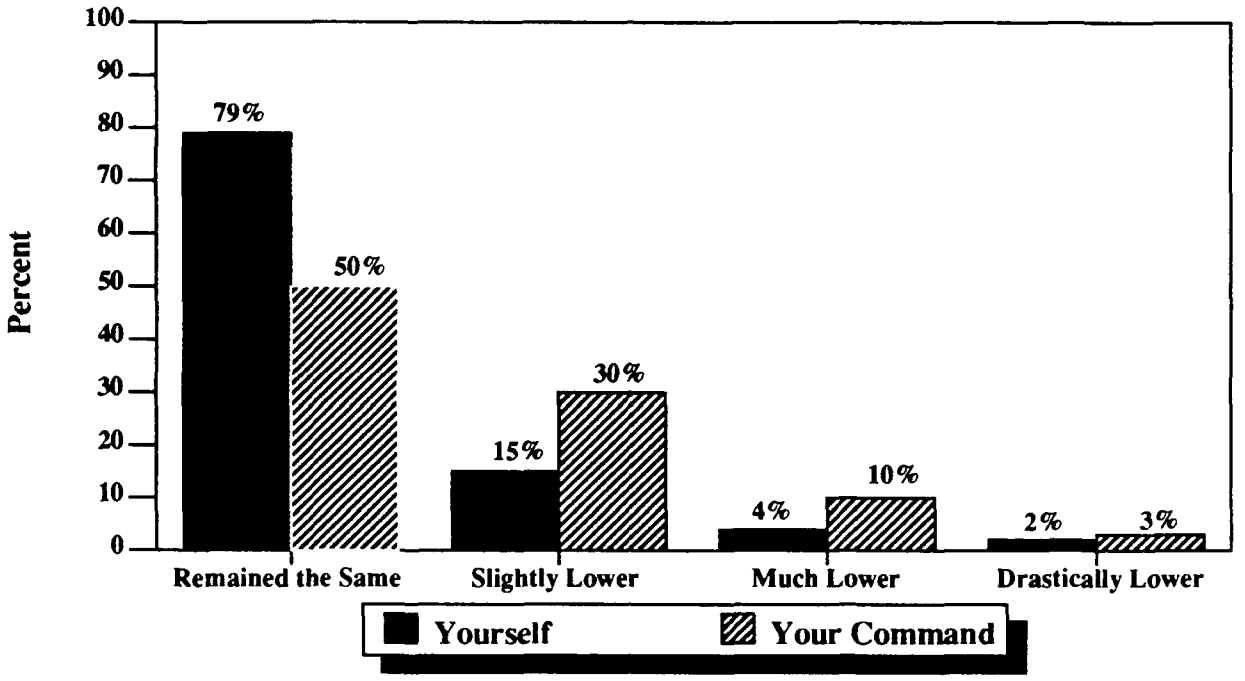

Figure 1. Effect of earthquake on performance: Military sample.

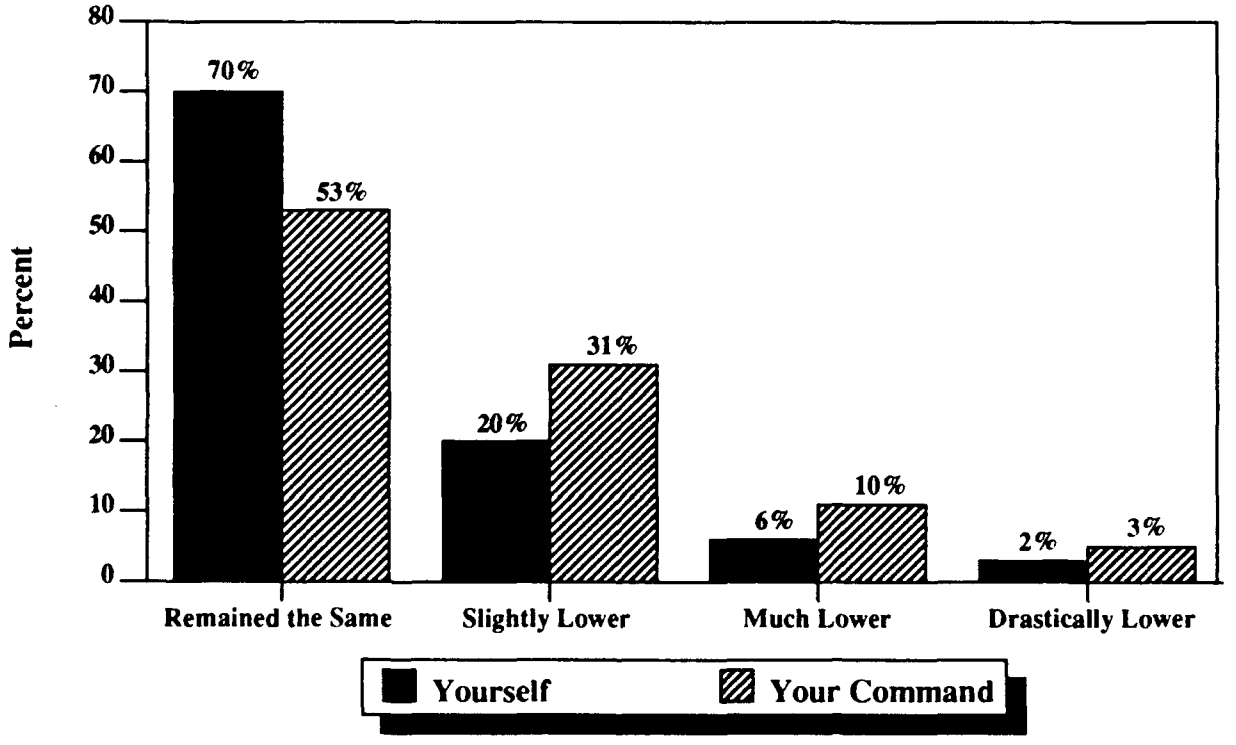

Figure 2. Effect of earthquake on morale: Military sample.

Four of the seven command leaders interviewed felt that morale in their commands was higher than normal after the earthquake. They attributed this high morale level to the fact that Navy personnel played a central role in disaster assistance operations in the area following the earthquake. Only one of the command leaders reported a lower level of morale in his command, and that only for the first day or so. When asked about the incidence of disruptive behaviors following the earthquake, none of the command leaders interviewed thought that there had been an increase in alcohol or drug abuse. One interviewee believed that there had been some increase in domestic violence problems.

Additionally, command leaders believed that there had been no earthquake-related increase in accidents or illness of command members.

Possible Impact on Retention

Two items were included in the surveys to examine the possible impact of post-traumatic stress associated with the earthquake on retention. When asked if their career intentions had changed, a total of nine percent of the military respondents said that they had either definitely decided to leave the Navy or were more inclined to leave the Navy following the earthquake. Spouse respondents were asked if their satisfaction with Navy life had been affected. Twelve percent said that they were somewhat less satisfied and another 8 percent were much less satisfied with Navy life following the earthquake. The relationship between these measures and measures of stress symptoms are shown in Table 13.

Earthquake Preparation

The number of spouses and military members who said that they had made earthquake preparations after the earthquake was greater than the number who said they had made such preparations before it occurred. Nevertheless, only 16 percent of each sample reported that they were now "well prepared." Seven months after the Loma Prieta Earthquake, 23 percent of the spouse sample and 46 percent of the military sample stated that they still had made no preparations for future occurrences.

Findings from Interviews with Service Providers

Twenty-two service providers in the area were interviewed to lend depth to the survey responses and to learn about their personal experiences. Two of the providers were chaplains and the rest represented 17 agencies located at Treasure Island, Alameda, Moffett Field, and Oakland. These agencies included FSCs, Counseling and Assistance Centers (CAACs), Child Development Centers and an elementary school, Family Advocacy Representatives (FARs), medical facilities, the Red Cross, Navy Relief, and a Teen and Youth Center.

Table 13

Correlations of Stress Symptoms with Members' Career Intentions and Spouses' Satisfaction with Navy Life

	Member Intentions to Leave Navy	Spouse Disatisfaction with Navy Life
Personal symptoms at 2 weeks	.13 (p = .000) (n = 2393)	.23 (p = .000) (n = 731)
Personal symptoms at 7 months	.18 (p = .000) (n = 2393)	.27 (p = .000) (n = 731)
Family problems at 2 weeks	.22 (p = .000) (n = 1465)	.30 (p = .000) (n = 731)
Family problems at 7 months	.26 (p = .000) (n = 1465)	.32 (p = .000) (n = 731)
Children's symptoms at 2 weeks	.06 (p = .038) (n = 1021)	.20 (p = .000) (n = 621)
Children's symptoms at 7 months	.07 (p = .010) (n = 1021)	.26 (p = 000) (n = 621)

Notes.

1. Zero-order Pearson product moment correlations.
2. Distributions for personal symptoms, family problems and childrens' symptoms have been corrected to approximate normal distributions.

Overall Reactions to the Earthquake

Service providers agreed that most individuals felt afraid, confused, and helpless when the earthquake occurred, including themselves. However, they had somewhat different perceptions about reactions in the period that followed. For example, one FSC counselor said that it was 3 months before it was "business as usual" at her agency. In contrast, a CAAC counselor said that his agency was closed for a few days and then "things were pretty much back to normal." Officials at an elementary school reported losing 50 students because parents were afraid to stay in the area, but the majority of service providers reported that most adults and children had calmed down appreciably within a month. Nevertheless, the service providers continued to see problems among their clients. They reported that after 8 months many adults were still irritable, had difficulty concentrating, and were prone to argue. Some children continued to have difficulty sleeping, and a reduced demand for hourly care at day care centers persisted, reflecting the parents' need to be with their children.

One of the two FARs interviewed reported an increase in child and spouse abuse, precipitated by stress and drinking, that persisted for 6 months after the earthquake. While the FAR identified new offenders as the source of the problem, a CAAC director said that individuals seen by that agency were primarily repeat offenders. A FSC director reported that drunk driving increased 2 months after the earthquake, which he interpreted to be a delayed reaction. A CAAC director felt that the earthquake had increased trust in the counselors and accelerated treatment success and that these positive effects still were occurring 6 months later.

Individuals Most Affected by the Earthquake

The service providers reported that individuals most vulnerable to the effects of the earthquake included spouses of deployed members, individuals who had recently left home for the first time, people with special medical problems, those who were poorly educated, and mothers of small children. Also, people with pre-existing stresses (e.g., younger spouses, foreign-born spouses, families with little support) and those with a history of trauma (e.g., the abused, Vietnam veterans) were felt to be especially vulnerable.

Actions and Reactions of Service Providers

There was an overall increase in requests for services, particularly at the FSCs. In order to function effectively, it was necessary for FSC personnel to cope first with their own reactions to the earthquake. Talking with their co-workers, either informally or in group meetings, helped them to recognize their feelings and deal with emotional consequences of the disaster. Some were able to draw on past training, as the Red Cross had recently conducted a seminar on disaster and earthquake preparedness at the Treasure Island Naval Station and other individuals had attended classes on post-traumatic stress. Some personnel reported feeling shock and numbness for up to 2 weeks, while difficulties in commuting and 12-hour shifts at some of the FSCs added to the stress.

Service providers initiated numerous actions taken to meet the needs of military personnel and their families in the post-earthquake period. Through various media, they publicized available services and communicated the typical emotional consequences of natural disasters. Fliers and messages were sent overseas to help military members understand the problems facing their families at home. Numerous "rap sessions" were held to allow individuals to share their concerns, express their emotions, and receive stress management advice.

To combat the feeling of helplessness, the FSCs asked enlisted personnel to list the ways in which work centers could be made safer during earthquakes and children were encouraged to assemble survival kits that could be used in the aftermath of an earthquake.

Responses of Commands

Service providers reported that local commands provided leadership and took the necessary actions to meet basic needs after the earthquake. For example, 4,000 free meals were provided to families on Treasure Island over a period of 2 weeks. Many of the actions taken by commands in the area have been detailed in the After Action Report published by Commander, Naval Base San Francisco (1990). Equally important, base commanders and other leaders publicly expressed

their own fears and emotional reactions to the earthquake and thus helped to legitimize what others were feeling.

The After Action Report also summarizes the high level of cooperation and mutual assistance between the military and civilian communities in the Bay Area.

DISCUSSION AND CONCLUSIONS

Although the Loma Prieta earthquake was classified as non-catastrophic, it had a profound effect on many people in the Bay Area. A comprehensive account of the physical and logistical problems experienced at Navy facilities can be found in the After Action Report distributed by Commander, Naval Base San Francisco (1990), which also provides a summary of "lessons learned" that can facilitate earthquake preparation for the future. It was the intention of this report, therefore, to focus on the personal, emotional effects of the earthquake on individuals in the Navy community.

Only a small percent of the military and spouse survey respondents sustained injuries or serious damage to their property because of the earthquake, and many respondents appeared to be experiencing no stress-related symptoms. Nevertheless, 39 percent of military respondents and 61 percent of spouse respondents reported psychological and/or physical symptoms (such as sleeplessness and anxiety) that may impair functioning. In general, individuals in the spouse sample experienced more symptoms, utilized more services, and acknowledged a greater number of needs than did military respondents.

Of the services available to help Navy people cope with the aftermath of a natural disaster, the services used with the greatest frequency were those offering physical assistance, such as the PWC or, on Treasure Island, the food and other supplies provided by the command. Less than 10 percent of both samples made use of the services designed to help them deal with their emotional reactions to the disaster, such as counseling services and command-sponsored "rap groups." In fact, the number of individuals from both samples who said that such services were not available was slightly larger than the number who used them. Despite the efforts to use the various media to communicate the availability of services, it would appear that the message did not reach significant numbers. An alternative interpretation is that some military families fear that acknowledgment of emotional problems is detrimental to one's military career even under disaster circumstances.

One indication of the importance of conducting outreach initiatives is contained in the analysis of coping styles, which suggested that those who coped with stress by obtaining support from formal sources had fewer symptoms than those who relied on informal sources of support. The causal direction of the relationship between coping style and symptoms has not been determined. It may be that those who take the initiative to obtain assistance from available formal sources are those who experience less stress, or it may be that receiving formal assistance is more effective in ameliorating stress than other strategies that people use. If we assume the latter, it is important that families find out where to obtain assistance, probably through a disaster preparation program.

In general, results from spouse and member surveys supported the conclusions of the service providers concerning the individuals most at risk for experiencing post-traumatic stress symptoms. For example, both data sources indicated that spouses and children of deployed members are likely to be particularly vulnerable. Also, younger spouses among the respondents experienced more stress-related symptoms and reported children's problems of longer duration following the earthquake than those in older age brackets.

Service providers who were interviewed stressed the importance of educating the public about what they should do to prepare for future earthquakes. Such education should not be limited to safety precautions or the assembling of survival kits--important as those things are - but should also inform people about what to expect emotionally, how to deal with post-traumatic stress, and the importance of seeking assistance. Members of certain high-risk groups may not participate in such disaster preparation training unless outreach efforts are directed toward them. Special attention should also be devoted to plans for helping children air their fears and anxieties, and educating their parents on ways to help the children deal with their anxieties.

Communications with dependents by service members at sea during any disaster is essential to maintain morale. Results suggested that there is room for improvement in this area. For example, 17 percent of the spouses who responded to the survey said that they needed assistance in communicating with their military spouse, but only about half of that number received assistance in this regard. Among members who were deployed when the earthquake occurred, 46 percent stated that more than 36 hours elapsed before they were able to establish communications with their families in the affected area.

Accounting for personnel and families was hampered by out-of-date recall bills and relying on the telephone system for recall of personnel did not work well in the Loma Prieta disaster. Attempts were not always made to account for the safety of dependents of those in deployed commands and met with only limited success when they were initiated. All of these findings underscore the importance of establishing lines of communication in advance and taking steps to assure that recall bills are up-to-date. Because ombudsmen play a crucial role in establishing communications between deployed commands and families, it is important that they receive training in disaster response procedures and that they have up-to-date information on how to contact families.

RECOMMENDATIONS

1. Develop and initiate disaster preparation education programs that address such topics as anticipated emotional reactions and where to obtain assistance.

2. Utilize out-reach strategies to reach those in high-risk populations.

3. Include provisions for helping children express their fears and anxieties in disaster response plans and educating their parents in the best ways to deal with children's fears and anxieties.

4. Provide command ombudsmen with recall bills that are kept up to-date by commands.

5. Provide training in disaster response procedures for ombudsmen.

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APPENDIX A

SURVEY QUESTIONNAIRES

DEPARTMENT OF THE NAVY
NAVY PERSONNEL RESEARCH AND DEVELOPMENT CENTER
SAN DIEGO, CALIFORNIA 92152-6800

From: Commanding Officer, Navy Personnel Research and Development Center
To: Navy Member

Subj: EARTHQUAKE EXPERIENCES SURVEY (SURVEY CONTROL SYMBOL 1700-11)

1. You are being asked to participate in a unique research project, which will assess the effects of the Loma Prieta earthquake on Navy members and (where applicable) their families in the Bay area. In completing the questionnaire, please try to think back several months and be as accurate as possible.

2. The purpose of this research is to assess the type of assistance that was available to you and (where applicable) your family, and the effectiveness of community efforts that were initiated. We are particularly interested in learning of needs that may have been unmet. The results of this research will be valuable in developing plans and policies that will help the Navy be prepared for other natural disasters.

3. A similar questionnaire is being sent to Navy spouses (where applicable). When possible, the responses given by a couple will be matched. For that reason and for a possible followup study, you are asked to enter your social security number. **YOUR RESPONSES WILL REMAIN ENTIRELY CONFIDENTIAL, AND NO RESULTS WILL BE REPORTED ON AN INDIVIDUAL BASIS.**

4. The questionnaire is easy to complete. Simply follow the directions throughout the questionnaire. For most items, you will check the appropriate response as the question applies to you. You may use pencil or pen. Enclose your completed questionnaire in the envelope provided, seal it, and return it to your command.

5. **IF YOU MOVED TO THE BAY AREA AFTER THE EARTHQUAKE, YOU DO NOT NEED TO COMPLETE THIS QUESTIONNAIRE. JUST WRITE "NO" ON THE FRONT OF THE SURVEY AND RETURN IT TO YOUR COMMAND.**

6. Thank you for taking the time to complete this questionnaire.

B. E. BACON
Captain, U. S. Navy
Commanding Officer

Navy Personnel Research and Development Center

San Diego, Ca. 92152 - 6800

May 1990

EARTHQUAKE EXPERIENCES SURVEY

Sponsored by
NMPC-66
Commander, Naval Base San Francisco
Family Service Center, Treasure Island
Family Service Center, Alameda

Conducted by
Navy Personnel Research and Development Center

Report Control Symbol
1700-11

Form A

PRIVACY ACT STATEMENT

Under the authority of 5 USC 301 regulations, you are requested to complete this questionnaire. Information furnished will be used for statistical studies to help the Navy improve policies and procedures. It will not be used for any administrative action concerning you specifically and will not be part of your permanent record. No adverse actions will be taken if you decide not to furnish this requested information.

1. Enter your Social Security Number: |__|__|__|-|__|__|-|__|__|__|__|

2. Enter your age at your last birthday: |__|__|

3. What is your racial group?
___ Black/Afro-American
___ American Indian/Alaskan Native
___ Hispanic/Mexican/Latin American
___ Oriental/Filipino/Pac.Islander
___ White/Caucasian
___ Other

4. What is your gender?
____ Male
____ Female

5. What is your paygrade?

___ E1	___ W1
___ E2	___ W2
___ E3	___ W3
___ E4	___ W4
___ E5	___ O1
___ E6	___ O2
___ E7	___ O3
___ E8	___ O4
___ E9	___ O5
___	___ O6

6. Enter your command UIC: |__|__|__|__|__|

7. What is your duty type?
____ Sea
____ Shore
____ Naval Air
____ Submarine

8. How much formal education do you have?
Check degrees or diplomas earned
___ None
___ High School Equivalent
___ High School
___ Less than 2 years college.
___ 2 years or more of college, no degree
___ Associate degree
___ Bachelor's degree
___ Master's degree
___ Doctoral degree
___ Professional Degree (M.D.,D.D.S., etc)

9. What is your marital status?
____ Single
____ Married
____ Divorced/Sep.
____ Widowed

10. Are you accompanied or unaccompanied at this station?
____ Accompanied
____ Unaccompanied

11. What is your dual-career status?
___ Not married
___ Navy spouse
___ Military spouse (other service)
___ Civilian spouse, employed full time
___ Civilian spouse, employed part time
___ Civilian spouse, unemployed

12. Please indicate the number of children you have in your household in each of the age categories below, and the sex of each child.

Age of children	No. of children	Sex of children CIRCLE ONE FOR EACH CHILD IN EACH CATEGORY
Birth to 2 yrs	____	m m m m f f f f
3 yrs to 5 yrs	____	m m m m f f f f
6 yrs to 9 yrs	____	m m m m f f f f
10 yrs to 13 yrs	____	m m m m f f f f
14 yrs to 17 yrs	____	m m m m f f f f
18 yrs and over	____	m m m m f f f f

13. How long have you been stationed in the Bay area?

___ Less than 3 months
___ 4 to 6 months
___ Seven to 12 months
___ 13 to 24 months
___ 25 to 36 months
___ More than 36 months

14. At the time of the earthquake, where were you living?

___ Military housing, Treasure Island
___ Military housing, NAS Alameda
___ Military housing, NSC Oakland
___ Military housing, Hamilton AFB
___ Military housing, Point Mulati
___ Off base in civilian housing

15. Had you had past experience(s) with earthquakes or other major natural disasters before the recent earthquake in San Francisco?

___ No
___ Yes

16. Did you or any member of your family suffer physical injury as a result of the earthquake?

	Yourself	Spouse	A Child
No injury	___	___	___
Minor injury	___	___	___
Major injury	___	___	___

17. Did the earthquake cause property damage to your residence and how extensive was it?

___ No damage to residence
___ Minor damage to residence
___ Major damage to residence
___ Residence was destroyed

18. Did the earthquake cause damage to your important personal property, such as household furnishings or automobiles?

___ No damage to personal property
___ Minor damage to personal property
___ Major damage to personal property
___ Personal property was destroyed.

19. At your residence, were you without any of the following services after the earthquake? CHECK ALL THAT APPLY.

___ Electricity
___ Natural gas
___ Telephone
___ Water
___ No

20. Were you deployed at the time of the earthquake?

___ No
___ Yes ---------->IF YES, ANSWER THE NEXT 3 ITEMS.
IF NO, SKIP TO ITEM 24:

21. How many weeks had you been deployed before the earthquake struck?

___ Less than 4 weeks
___ 4 to 8 weeks
___ 9 to 12 weeks
___ 13 to 16 weeks
___ 17 to 20 weeks
___ 21 to 24 weeks
___ More than 24 weeks

22. How many hours elapsed before your were able to establish communications with your family?

___ Less than 3 hours
___ 3 to 6 hours
___ 7 to 12 hours
___ 13 to 24 hours
___ 25 to 36 hours
___ More than 36 hours

23. How long after the earthquake did you return from your deployment?

___ Less than 2 weeks
___ 2 to 4 weeks
___ 5 to 8 weeks
___ 9 to 12 weeks
___ 13 to 16 weeks
___ 17 to 20 weeks

In the following section, please indicate where you and each member of your family were when the earthquake struck.

24. Yourself

___ At home
___ On-base
___ At work
___ Aboard ship
___ On duty, but off station
___ Other

25. Your Spouse

___ At home
___ At work
___ Aboard ship
___ In your neighborhood
___ In the urban area (but not at work)
___ Other

26. Oldest Child

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

27. Next Oldest

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

28. Next Oldest

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

29. Next Oldest

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

30. Next Oldest

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

31. Next Oldest

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

32. After the earthquake, how long was it before you were able to determine that all members of your immediate family were safe?

___ Less than 1 hour
___ 1 - 3 hours
___ 4 - 6 hours
___ 7 - 12 hours
___ 13 - 24 hours
___ 25 - 36 hours
___ More than 36 hours
___ I do not have a spouse and/or children
___ My spouse and/or children did not accompany me to this station

33. After the earthquake, how long was it before your household members were all at home together?

___ Less than 1 hour
___ 1 - 2 hours
___ 3 - 4 hours
___ 5 - 8 hours
___ More than 8 hours
___ I do not have a spouse and/or children
___ My spouse and/or children did not accompany me to this station

34. How soon after the earthquake were you able to communicate with your extended family in other parts of the country?

___ Less than 3 hours
___ 3 to 6 hours
___ 7 to 12 hours
___ 13 to 24 hours
___ 25 to 36 hours
___ More than 36 hours

35. Was the normal mode of transportation to and from work disrupted for you or your spouse?

___ Yes, for me
___ Yes, for my spouse
___ Yes, for both my spouse and me
___ No

36. Would you say that the people you normally interact with are likely to be

___ Close, intimate friends you can call upon for support
___ Friends with whom you share social occasions but not intimacies
___ Primarily neighborhood and work acquaintances

37. Do you have relatives in the Bay area?
___ Yes
___ No

38. Immediately after the earthquake did you participate in rescue activities
___ On the base?
___ In your community?
___ Elsewhere in the city?
___ None of the above

This section concerns the services that were available to people in the area after the earthquake. We would like you to indicate from the list below which services you and/or your family used, and your level of satisfaction with each service used.

	Used	Not Used	Not Available	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied
39. Rap workshops for family members	___	___	___	___	___	___	___
40. Emergency food/supplies from command	___	___	___	___	___	___	___
41. Family Service Center Information & Referral	___	___	___	___	___	___	___
42. Red Cross	___	___	___	___	___	___	___
43. Family Service Center counseling services	___	___	___	___	___	___	___
44. Federal Emergency Management Agency	___	___	___	___	___	___	___
45. Navy Relief	___	___	___	___	___	___	___
46. Structured activities for school-age children	___	___	___	___	___	___	___
47. Emergency supplies from other sources	___	___	___	___	___	___	___
48. Chaplains	___	___	___	___	___	___	___
49. Church relief agencies	___	___	___	___	___	___	___
50. Psychological services from other commands (e.g., Letterman Hospital)	___	___	___	___	___	___	___
51. Ombudsmen Network	___	___	___	___	___	___	___
52. Stress management workshops	___	___	___	___	___	___	___
53. City agencies	___	___	___	___	___	___	___
54. County agencies	___	___	___	___	___	___	___
55. Base Security	___	___	___	___	___	___	___
56. Fire Department	___	___	___	___	___	___	___
57. Public Works Center	___	___	___	___	___	___	___

Please tell us about needs you and/or your family had during the post-quake period, and if you were able to obtain the assistance you needed. CHECK ALL THAT APPLY FROM THE LIST BELOW, AND WRITE IN ANY THAT AREN'T ON THE LIST.

	Need		Obtained Assistance
58.	___	Someone to talk to	___
59.	___	Assistance in cleaning up damage at home	___
60.	___	Assistance with home repair	___
61.	___	Transportation assistance	___
62.	___	Assistance in communicating with my spouse	___
63.	___	Child care	___
64.	___	Therapy for children	___
65.	___	Temporary financial assistance	___
66.	___	Personal counseling	___
67.	___	Family or marital counseling	___
68.	___	Other: _____	___
69.	___	Other: _____	___
70.	___	Other: _____	___
71.	___	Other: _____	___

Listed below are a number of ways people cope with difficult and stressful situations. Read the list carefully, and indicate which coping strategies you and/or your family used in the post-quake period. CHECK ALL THAT APPLY, THEN USE THE COLUMN ON THE RIGHT TO CHECK THE *ONE* STRATEGY THAT WORKED BEST.

72.	___	Left the area for a while	___
73.	___	Turned to friends for help and support	___
74.	___	Turned to extended family for help and support	___
75.	___	Talked within the family about the earthquake	___
76.	___	Attended church services	___
77.	___	Watched television/listened to the radio	___
78.	___	Adopted a fatalistic attitude-"whatever's going to happen will happen".	___
79.	___	Sought advice from relatives	___
80.	___	Asked neighbors for favors and assistance	___
81.	___	Helped others with quake damage	___
82.	___	Restricted family conversation to other, normal things	___
83.	___	Spent much more time together as a family	___
84.	___	Partied with friends to help forget	___
85.	___	Sought professional counseling help	___
86.	___	Sought assistance from agencies and programs designed to help in this situation.	___
87.	___	Sought information and advice from family doctor	___
88.	___	Made preparations for future earthquakes.	___

89. How many days were you unable to report for duty due to problems associated with the earthquake?

___ None, on duty every day
___ 1 day
___ 2 days
___ 3 days
___ 4 days
___ 5 days
___ 6 days
___ 7 days
___ More than 7 days

90. How do you think stress associated with the earthquake affected job performance and productivity for yourself and in your command?

Yourself		Your Command
___	Performance/productivity remained the same	___
___	Performance/productivity were slightly lower	___
___	Performance/productivity were much lower	___
___	Performance/productivity were drastically lower	___

91. How do you think stress associated with the earthquake affected your morale and morale in the command?

Your Morale		Command Morale
___	Morale was unchanged	___
___	Morale was slightly lower	___
___	Morale was much lower	___
___	Morale was drastically lower	___

92. Did the earthquake and the events surrounding it have any effect on your career intentions?

___ My career plans are unchanged
___ Since the earthquake, I am more inclined to separate from the Navy
___ Since the earthquake, I have definitely decided to separate from the Navy

93. Did you find that you were experiencing more conflicts with your fellow command members in the stressful period after the earthquake?

___ Yes
___ Possibly
___ No

94. Did you find that you were experiencing more conflicts with your supervisor after the earthquake?
___ Yes
___ Possibly
___ No

95. Did you find that you were more accident prone in the period after the earthquake?
___ Yes
___ Possibly
___ No

96. Did you feel that your command leaders were supportive during the stressful period following the earthquake?
___ Yes
___ Somewhat
___ No

97. IF YES, in what way did your command leaders demonstrate their support?
___ Modifying leave policy
___ Relaxing demands
___ Providing information about services
___ Increasing communications
___ Other: _____

Post-traumatic stress can show up in a variety of physical and psychological symptoms. A list of common symptoms is presented below. Please check those that you experienced during the first two weeks after the earthquake, and those that you are experiencing at the present time.

	At 2 weeks	Now
98. Difficulty falling asleep	___	___
99. Crying for no reason at all	___	___
100. Trouble remembering things	___	___
101. Difficulty sleeping through the night	___	___
102. Difficulty concentrating	___	___
103. Loss of appetite	___	___
104. Weight loss	___	___
105. Nightmares	___	___
106. Feeling "numb", unable to relate to others	___	___
107. Nervous laughter	___	___
108. Feeling anxious all the time	___	___
109. Feeling lethargic or apathetic	___	___
110. Excessive fatigue	___	___
111. Large weight gain	___	___
112. Digestive problems	___	___

113. Decreased sexual desire ___ ___
114. Anxious when separated from spouse or family ___ ___
115. Short-tempered at work ___ ___
116. Short-tempered with family ___ ___
117. Feeling angry much of the time ___ ___
118. Feeling guilty because others were hurt more ___ ___
119. Shunning other people, staying away from social gatherings ___ ___
120. Feeling punished for something you didn't do ___ ___
121. Fearful of returning to certain places ___ ___
122. Feeling that you don't trust other people ___ ___
123. Feeling threatened by forces beyond your control ___ ___
124. Not knowing what to do next. ___ ___

IF YOU ARE SINGLE AND DO NOT HAVE CHILDREN LIVING WITH YOU, SKIP TO ITEM 151.

Children often react to fearful or stressful experiences with an increase in problem behaviors such as those listed below. We are interested in changes in behavior that have occurred following the earthquake and may still be occurring. Please check any of the following that apply to any child in your household.

		First 2 weeks	Now
125.	Frequent nightmares	___	___
126.	Bedwetting	___	___
127	Eating problems	___	___
128.	Refusing to sleep in own bed	___	___
129.	Aggressive behaviors	___	___
130.	Thumbsucking	___	___
131.	Refusing to leave caretaker's side	___	___
132.	Poor school performance	___	___
133.	Withdrawn, passive	___	___
134.	Crying	___	___
135.	Difficulty getting along with friends	___	___
136.	Difficulty sleeping	___	___
137.	Refusing to go to school	___	___
138.	Tantrums	___	___
139.	Physical complaints (e.g., stomach aches, headaches)	___	___
140.	Frequent illnesses	___	___
141.	Difficulty getting along with family.	___	___

We are interested in learning how the stresses associated with the earthquake may have affected the way your family functioned during the first two weeks and at this time. Please complete the inventory below. CHECK ALL THAT APPLY FOR BOTH TIME PERIODS.

		First 2 Weeks	Now
142.	A family member appears to depend on alcohol or drugs	___	___
143.	A family member appears to have emotional problems	___	___
144.	There is an increase in conflicts between husband and wife	___	___
145.	Increased arguments between parents and children	___	___
146.	An increase in the number of problems or issues which don't get resolved	___	___
147.	Physical and/or psychological violence in the home	___	___
148.	Increased difficulty with sexual relationship between husband and wife	___	___
149.	Increased arguments among siblings	___	___
150.	Spouse is less supportive of Navy career	___	___

151. Before the earthquake, had you received training in preparing for natural disasters, such as earthquakes?

___ Yes
___ No

152. Before the earthquake, had you and/or your family made the recommended preparations for an earthquake?

___ Yes, well prepared
___ Had made some preparations
___ No

153. Following the earthquake, have you and/or your family implemented the recommended preparations for an earthquake?

___ Yes, well prepared
___ Have made some preparations
___ No

154. After your recent experiences, are you more or less concerned or frightened about future earthquakes in the area?

___ More concerned and frightened
___ About the same
___ Less concerned and frightened

IN THIS LAST SECTION, PLEASE INDICATE HOW MANY OF THE EVENTS LISTED, BOTH HAPPY AND SAD, HAVE OCCURRED IN YOUR LIFE IN THE PAST YEAR. CHECK ALL THAT APPLY.

155. ___ Death of spouse
156. ___ Divorce
157. ___ Marital separation
158. ___ Breakup of intimate relationship
159. ___ Birth of a child
160. ___ Getting married
161. ___ Relocation
162. ___ Spouse beginning or ceasing work outside the home
163. ___ Change in work responsibilities
164. ___ Major personal injury or illness - you or a family member
165. ___ Death of a close friend
166. ___ Death of a close family member
167. ___ Trouble with in-laws
168. ___ An outstanding achievement
169. ___ Sexual difficulties
170. ___ Trouble with the authorities
171. ___ Purchasing a home
172. ___ Major change in your financial state
173. ___ Son or daughter leaving home
174. ___ Reconcilation with spouse
175. ___ Death of a pet

#*#

A team of university researchers have received permission to conduct a second phase of research into post-earthquake stress in the military community in the Bay area. Your participation can make a valuable contribution to this important research.

If you are willing to participate, please sign below and enter your phone number and social security number. As in the survey just completed, your confidentiality will be protected.

Yes, I am willing to participate in Phase 2 of this research.

_____ Date: _____
Name

Telephone ___ _____ SSN 1__1__1__1-1__1__1-1__1__1__1__1

Navy Personnel Research and Development Center

San Diego, Ca. 92152 - 6800

May 1990

EARTHQUAKE EXPERIENCES SURVEY

Sponsored by
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Commander, Naval Base San Francisco
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Form B

PRIVACY ACT STATEMENT

Under the authority of 5 USC 301 regulations, you are requested to complete this questionnaire. Information furnished will be used for statistical studies to help the Navy improve policies and procedures. It will not be used for any administrative action concerning you specifically and will not be part of your permanent record. No adverse actions will be taken if you decide not to furnish this requested information.

1. **Sponsor's Social Security Number:** |__|__|__|-|__|__|-|__|__|__|__|

COMPLETE ITEMS 2 THROUGH 8 WITH INFORMATION ABOUT YOURSELF, NOT YOUR SPONSOR.

2. Enter your age at your last birthday: |___|___|

3. What is your racial group?
___ Black/Afro-American
___ American Indian/Alaskan Native
___ Hispanic/Mexican/Latin American
___ Oriental/Filipino/Pac.Islander
___ White/Caucasian
___ Other

4. How much formal education do you have?
Check degrees or diplomas earned
___ None
___ High School Equivalent
___ High School
___ Less than 2 years college
___ 2 years or more college, no degree
___ Associate degree
___ Bachelor's degree
___ Master's degree
___ Doctoral degree
___ Professional degree (M.D.,D.D.S.,etc)

5. What is your gender?
___ Male
___ Female

6. What is your dual career status?
___ Navy member ---------->
___ Member of another military service
___ *Civilian, employed full time*
___ Civilian, employed part time
___ Civilian, unemployed

IF YOU ARE ALSO A NAVY MEMBER, COMPLETE ITEMS 7 AND 8. IF NOT A NAVY MEMBER, SKIP TO ITEM 9.

7. Enter your command UIC: |__|__|__|__|__|__|

8. What is your paygrade?

___ E1	___ W1
___ E2	___ W2
___ E3	___ W3
___ E4	___ W4
___ E5	___ O1
___ E6	___ O2
___ E7	___ O3
___ E8	___ O4
___ E9	___ O5
	___ O6

9. Please indicate the number of children you have in your household in each of the age categories below, and the sex of each child.

Age of children	No. of children	Sex of children. CIRCLE ONE FOR EACH CHILD IN EACH CATEGORY
Birth to 2 yrs	____	m m m m f f f f
3 yrs to 5 yrs	____	m m m m f f f f
6 yrs to 9 yrs	____	m m m m f f f f
10 yrs to 13 yrs	____	m m m m f f f f
14 yrs to 17 yrs	____	m m m m f f f f
18 yrs and over	____	m m m m f f f f

10. How long have you lived in the Bay area?

___ Less than 3 months
___ 4 to 6 months
___ 7 to 12 months
___ 13 to 24 months
___ 25 to 36 months
___ More than 36 months

11. At the time of the earthquake, where were you living?

___ Military housing, Treasure Island
___ Military housing, NAS Alameda
___ Military housing, NSC Oakland
___ Military housing, Hamilton AFB
___ Military housing, Point Mulati
___ Off base in civilian housing

12. Had you had past experience(s) with earthquakes or other major natural disasters before the recent earthquake in San Francisco?

___ No
___ Yes

13. Did you or any member of your family suffer physical injury as a result of the earthquake?

	Yourself	Spouse	A Child
No injury	___	___	___
Minor injury	___	___	___
Major injury	___	___	___

14. Did the earthquake cause property damage to your residence and how extensive was it?

___ No damage to residence
___ Minor damage to residence
___ Major damage to residence
___ Residence was destroyed

15. Did the earthquake cause damage to your important personal property, such as household furnishings or automobiles?

___ No damage to personal property
___ Minor damage to personal property
___ Major damage to personal property
___ Personal property was destroyed.

16. At your residence, were you without any of the following services after the earthquake? CHECK ALL THAT APPLY.

___ Electricity
___ Natural gas
___ Telephone
___ Water
___ No

17. Was your spouse deployed at the time of the earthquake?

___ No
___ Yes **IF YES, ANSWER THE NEXT 3 ITEMS.**
IF NO, SKIP TO ITEM 21:

18. How many weeks had he/she been deployed before the earthquake struck?

___ Less than 4 weeks
___ 4 to 8 weeks
___ 9 to 12 weeks
___ 13 to 16 weeks
___ 17 to 20 weeks
___ 21 to 24 weeks
___ More than 24 weeks

19. How many hours elapsed before your spouse was able to establish communications with you?

___ Less than 3 hours
___ 3 to 6 hours
___ 7 to 12 hours
___ 13 to 24 hours
___ 25 to 36 hours
___ More than 36 hours

20. How long after the earthquake did he/she return from deployment?

___ Less than 2 weeks
___ 2 to 4 weeks
___ 5 to 8 weeks
___ 9 to 12 weeks
___ 13 to 16 weeks
___ 17 to 20 weeks

In the following section, please indicate where you and each member of your family were when the earthquake struck.

21. Your Spouse

___ At home
___ On-base
___ At work
___ Aboard ship
___ On duty, but off station
___ Other

22. Yourself

___ At home
___ At work
___ Aboard ship
___ In your neighborhood
___ In the urban area (but not at work)
___ Other

23. Oldest Child

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

24. Next Oldest

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

25. Next Oldest

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

26. Next Oldest

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

27. Next Oldest

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

28. Next Oldest

___ At home
___ At school
___ At child care
___ With a friend/ relative
___ At his/her job
___ Playground or rec center
___ Other

29. After the earthquake, how long was it before you were able to determine that all members of your immediate family were safe?

___ Less than 1 hour
___ 1 - 3 hours
___ 4 - 6 hours
___ 7 - 12 hours
___ 13 - 24 hours
___ 25 - 36 hours
___ More than 36 hours

30. After the earthquake, how long was it before your household members were all at home together?

___ Less than 1 hour
___ 1 - 2 hours
___ 3 - 4 hours
___ 5 - 8 hours
___ More than 8 hours

31. How soon after the earthquake were you able to communicate with your extended family in other parts of the country?

___ Less than 3 hours
___ 3 to 6 hours
___ 7 to 12 hours
___ 13 to 24 hours
___ 25 to 36 hours
___ More than 36 hours

32. Was the normal mode of transportation to and from work disrupted for you or your spouse?

___ Yes, for me
___ Yes, for my spouse
___ Yes, for both my spouse and me
___ No

33. Would you say that the people you normally interact with are are likely to be:

___ Close, intimate friends you can call upon for support
___ Friends with whom you share social occasions but not intimacies
___ Primarily neighborhood and work acquaintances

34. Do you have relatives in the Bay area?
___ Yes
___ No

35. Immediately after the earthquake did you participate in rescue activities
___ On the base?
___ In your community?
___ Elsewhere in the city?
___ None of the above

This section concerns the services which were available to people in the area after the earthquake. We would like you to indicate from the list below which services you and/or your family used, and your level of satisfaction with each service used.

	Used	Not Used	Not Available	Very Satisfied	Satisfied	Dissatisfied	Very Dissatisfied
36. Rap workshops for family members	___	___	___	___	___	___	___
37. Emergency food/supplies from command	___	___	___	___	___	___	___
38. Family Service Center Information & Referral	___	___	___	___	___	___	___
39. Red Cross	___	___	___	___	___	___	___
40. Family Service Center counseling services	___	___	___	___	___	___	___
41. Federal Emergency Management Agency	___	___	___	___	___	___	___
42. Navy Relief	___	___	___	___	___	___	___
43. Structured activities for school-age children	___	___	___	___	___	___	___
44. Emergency supplies from other sources	___	___	___	___	___	___	___
45. Chaplains	___	___	___	___	___	___	___
46. Church relief agencies	___	___	___	___	___	___	___
47. Psychological services from other commands (e.g., Letterman Hospital)	___	___	___	___	___	___	___
48. Ombudsmen Network	___	___	___	___	___	___	___
49. Stress management workshops	___	___	___	___	___	___	___
50. City agencies	___	___	___	___	___	___	___
51. County agencies	___	___	___	___	___	___	___
52. Base Security	___	___	___	___	___	___	___
53. Fire Department	___	___	___	___	___	___	___
54. Public Works Center	___	___	___	___	___	___	___

Please tell us about needs you and/or your family had during the post-quake period and *if you were* able to obtain the assistance you needed. CHECK ALL THAT APPLY FROM THE LIST BELOW AND WRITE IN ANY THAT AREN'T ON THE LIST.

	Needed		Obtained Assistance
55.	___	Someone to talk to	___
56.	___	Assistance in cleaning up damage at home	___
57.	___	Assistance with home repair	___
58.	___	Transportation assistance	___
59.	___	Assistance in communicating with my spouse	___
60.	___	Child care	___
61.	___	Therapy for children	___
62.	___	Temporary financial assistance	___
63.	___	Personal counseling	___
64.	___	Family or marital counseling	___
65.	___	Other: _____	___
66.	___	Other: _____	___
67.	___	Other: _____	___
68.	___	Other: _____	___

Listed below are a number of ways people cope with difficult and stressful situations. Read the list carefully, and indicate which coping strategies you and/or your family used in the post-quake period. CHECK ALL THAT APPLY, THEN USE THE COLUMN ON THE RIGHT TO CHECK THE *ONE* STRATEGY THAT WORKED BEST.

69.	___	Left the area for a while	___
70.	___	Turned to friends for help and support	___
71.	___	Turned to extended family for help and support	___
72.	___	Talked within the family about the earthquake	___
73.	___	Attended church services	___
74.	___	Watched television	___
75.	___	Adopted a fatalistic attitude--"whatever's going to happen will happen."	___
76.	___	Sought advice from relatives	___
77.	___	Asked neighbors for favors and assistance	___
78.	___	Helped others with quake damage	___
79.	___	Restricted family conversation to other, normal things	___
80.	___	Spent much more time together as a family	___
81.	___	Partied with friends to help forget	___
82.	___	Sought professional counseling help	___
83.	___	Sought assistance from agencies and programs designed to help in this situation.	___
84.	___	Sought information and advice from family doctor	___
85.	___	Made preparations for future earthquakes.	___

86. If you are employed, how many days were you unable to go to work due to problems associated with the earthquake?

___ None
___ 1 day
___ 2 days
___ 3 days
___ 4 days
___ 5 days
___ 6 days
___ 7 days
___ More than 7 days
___ Not applicable

87. If you are employed, did you find that you were experiencing more conflicts with your fellow workers in the stressful period after the earthquake?

___ Yes
___ Possibly
___ No
___ Not applicable

88. If you are employed, did you find that you were experiencing more conflicts with your supervisor after the earthquake?

___ Yes
___ Possibly
___ No
___ Not applicable

89. Did the earthquake and the events surrounding it have any effect on your satisfaction with Navy life?

___ My satisfaction with Navy life has not changed
___ Since the earthquake, I am somewhat less satisfied with Navy life
___ Since the earthquake, I am much less satisfied with Navy life.

90. Did you find that you were more accident prone in the period after the earthquake?

___ Yes
___ Possibly
___ No

Post-traumatic stress can show up in a variety of physical and psychological symptoms. A list of common symptoms is presented below. Please check those that you experienced during the first two weeks after the earthquake, and those that you are experiencing at the present time.

	At 2 weeks	Now
91. Difficulty falling asleep	___	___
92. Crying for no reason at all	___	___
93. Trouble remembering things	___	___
94. Difficulty sleeping through the night	___	___
95. Difficulty concentrating	___	___
96. Loss of appetite	___	___
97. Weight loss	___	___
98. Nightmares	___	___
99. Feeling "numb", unable to relate to others	___	___
100. Nervous laughter	___	___
101. Feeling anxious all the time	___	___

102. Feeling lethargic or apathetic	___	___
103. Excessive fatigue	___	___
104. Large weight gain	___	___
105. Digestive problems	___	___
106. Decreased sexual desire	___	___
107. Anxious when separated from spouse or family	___	___
108. Short-tempered at work	___	___
109. Short-tempered with family	___	___
110. Feeling angry much of the time	___	___
111. Feeling guilty because others were hurt more	___	___
112. Shunning other people, staying away from social gatherings	___	___
113. Feeling punished for something you didn't do	___	___
114. Fearful of returning to certain places	___	___
115. Feeling that you don't trust other people	___	___
116. Feeling threatened by forces beyond your control	___	___
117. Not knowing what to do next.	___	___

IF YOU DO NOT HAVE CHILDREN LIVING WITH YOU, SKIP TO ITEM 135.

Children often react to fearful or stressful experiences with an increase in problem behaviors such as those listed below. We are interested in changes in behavior that have occurred following the earthquake and may still be occurring. Please check any of the following that apply to any child in your household.

		First 2 weeks	Now
118.	Frequent nightmares	___	___
119.	Bedwetting	___	___
120.	Eating problems	___	___
121	Refusing to sleep in own bed	___	___
122.	Aggressive behaviors	___	___
123.	Thumbsucking	___	___
124.	Refusing to leave caretaker's side	___	___
125.	Poor school performance	___	___
126.	Withdrawn, passive	___	___
127.	Crying	___	___
128.	Difficulty getting along with friends	___	___
129.	Difficulty sleeping	___	___
130.	Refusing to go to school	___	___
131.	Tantrums	___	___
132.	Physical complaints (e.g., stomach aches, headaches)	___	___
133.	Frequent illnesses	___	___
134.	Difficulty getting along with family.	___	___

We are interested in learning how the stresses associated with the earthquake may have affected the way your family functioned during the first two weeks and at this time. Please complete the inventory below. CHECK ALL THAT APPLY FOR BOTH TIME PERIODS.

		First 2 Weeks	Now
135.	A family member appears to depend on alcohol or drugs	___	___
136.	A family member appears to have emotional problems	___	___
137.	There is an increase in conflicts between husband and wife	___	___
138.	Increased arguments between parents and children	___	___
139.	An increase in the number of problems or issues which don't get resolved	___	___
140.	Physical and/or psychological violence in the home	___	___
141.	Increased difficulty with sexual relationship between husband and wife	___	___
142.	Increased arguments among siblings	___	___
143.	Spouse is less supportive of members's Navy career	___	___

144. Before the earthquake, had you received training in preparing for natural disasters, such as earthquakes?

___ Yes
___ No

145. Before the earthquake, had you and/or your family made the recommended preparations for an earthquake?

___ Yes, well prepared
___ Had made some preparations
___ No

146. Following the earthquake, have you and/or your family implemented the recommended preparations for an earthquake?

___ Yes, well prepared
___ Have made some preparations
___ No

147. After your recent experiences, are you more or less concerned or frightened about future earthquakes in the area?

___ More concerned and frightened
___ About the same
___ Less concerned and frightened

IN THIS LAST SECTION, PLEASE INDICATE HOW MANY OF THE EVENTS LISTED, BOTH HAPPY AND SAD, HAVE OCCURRED IN YOUR LIFE IN THE PAST YEAR. CHECK ALL THAT APPLY.

148. ___ Death of spouse
149. ___ Divorce
150. ___ Marital separation
151. ___ Breakup of intimate relationship
152. ___ Birth of a child
153. ___ Getting married
154. ___ Relocation
155. ___ Spouse beginning or ceasing work outside the home
156. ___ Change in work responsibilities
157. ___ Major personal injury or illness - you or a family member
158. ___ Death of a close friend
159. ___ Death of a close family member
160. ___ Trouble with in-laws
161. ___ An outstanding achievement
162. ___ Sexual difficulties
163. ___ Trouble with the authorities
164. ___ Purchasing a home
165. ___ Major change in your financial state
166. ___ Son or daughter leaving home
167. ___ Reconcilation with spouse
168. ___ Death of a pet

#*#

A team of university researchers have received permission to conduct a second phase of research into post-earthquake stress in the military community in the Bay area. Your participation can make a valuable contribution to this important research.

If you are willing to participate, please sign below and enter your phone number and social security number. As in the survey just completed, your confidentiality will be protected.

Yes, I am willing to participate in Phase 2 of this research.

_____ Date: _____
Name

Telephone ___ _____ SSN l__l__l__l-l__l__l-l__l__l__l__l

APPENDIX B

SUPPLEMENTAL TABLES

Table B-1

Rotated Factor Matrix of Coping Strategies--Military Sample
Principal Components Analysis with Varimax Rotation

Coping Strategy	Factor 1	Factor 2	Factor 3	Factor 4
Support from Formal Sources				
Sought advice from family doctor	.80			
Sought professional counseling	.75			
Sought assistance from agencies, programs	.67			
Restricted family conversation to other	.66			
Asked neighbors for assistance	.50		.30	
Active/Self-Sufficient				
Talked within the family about earthquake		.74		
Watched television		.68		
Made preparations for future earthquakes		.68		
Spent much more time together as family		.58		
Helped others with quake damage		.47		
Attended church services		.34		
Support from Informal Sources				
Turned to friends			.77	
Turned to extended family			.74	
Left area for awhile			.50	
Sought advice from relatives	.35		.42	
Avoidance				
Adopted fatalistic attitude				.73
Partied with friends to forget				.71

Note. Coefficients less than .30 have been suppressed.

Table B-2

Rotated Factor Matrix of Coping Strategies--Spouse Sample Principal Components Analysis with Varimax Rotation

Coping Strategy	Factor 1	Factor 2	Factor 3	Factor 4
Support from Informal Sources				
Turned to extended family	.72			
Turned to friends	.61			
Sought advice from relatives	.58			
Asked neighbors for assistance	.52			
Left area for awhile	.46			
Active/Self-Sufficient				
Made preparations for future earthquakes		.61		
Talked within the family about earthquake		.61		
Spent much more time together as family		.52		
Attended church services		.46	-.33	
Helped others with quake damage		.35		
Support from Formal Sources				
Sought advice from family doctor			.67	
Sought professional counseling			.63	
Sought assistance from agencies, programs	.30		.53	
Avoidance				
Adopted fatalistic attitude				.70
Partied with friends to forget				.56
Watched television				.41

Notes. Coefficients less than .30 have been suppressed.

Table B-3

Disruption of Utilities Service by Housing Area as Reported by Military and Spouse Respondents

	Electricity		Gas		Phone		Water	
Housing Area	Spouse	Member	Spouse	Member	Spouse	Member	Spouse	Member
	(%)	(%)	(%)	(%)	(%)	(%)	(%)	(%)
Treasure Island	78	67	93	69	25	27	87	75
NAS, Alameda	82	60	51	26	66	37	56	61
NSC, Oakland	78	25	100	16	22	27	67	16
Hamilton AFB	9	13	14	22	12	12	0	4
Point Mulati	90	71	0	0	40	29	10	14
Civilian Housing	55	44	11	15	47	42	17	12

Table B-4

Analysis of Variance Summary: Marital Status, Parental Status and Deployment Effects on Number of Personal Symptoms: Military Sample

Source of Variation	Mean Square	DF	F	Sig of F
	At Two Weeks			
Main Effects				
Marital Status	94.36	2	12.47	.000
Parental Category	12.91	1	1.71	.192
Deployment	217.25	1	28.70	.000
2-Way Interactions				
Marital x Parental	13.52	2	1.79	.168
Marital x Deployment	17.52	2	2.31	.099
Parental x Deployment	12.48	1	1.65	.199
3-Way Interaction				
Parental x Marital x Deployment	5.75	2	.76	.468
Residual (Error)	7.57	2444		
	At Seven Months			
Main Effects				
Marital Status	2.86	2	.63	.534
Parental Category	.36	1	.08	.779
Deployment	77.35	1	16.98	.000
2-Way Interactions				
Marital x Parental	.26	2	.06	.944
Marital x Deployment	.88	2	.19	.824
Parental x Deployment	3.98	1	.87	.350
3-Way Interaction				
Parental x Marital x Deployment	1.08	2	.24	.788
Residual (Error)	4.55	2444		

Note. Distributions for personal symptoms have been corrected to approximate normal distributions.

Table B-5

Analysis of Variance Summary: Deployment and Parental Effects on Number of Personal Symptoms--Spouse Sample

Source of Variation	Mean Square	DF	F	Sig of F
	At Two Weeks			
Main Effect				
Military Spouse Deployment	252.73	1	32.49	.000
Parental Category	12.09	1	1.56	.213
Interaction				
Deployment x Parental	.00	1	.00	.995
Residual (Error)	7.78	771		
	At Seven Months			
Main Effects				
Military Spouse Deployment	140.22	1	17.72	.000
Parental Category	6.77	1	.85	.355
Interacuon				
Deployment x Parental	10.72	1	1.35	.245
Residual (Error)	7.91	771		

Note. Distributions for personal symptoms have been corrected to approximate normal distributions.

Table B-6

Coping Styles Employed by Military and Spouse Marital and Parental Groups

Group	Coping Style: Formal Support (%)	Active/ Self-Sufficient (%)	Informal Support (%)	Avoidance (%)
Military Sample				
Single, no children	46	9	17	28
Single, with children	60	12	9	19
Married, no children	30	29	17	24
Married, with children	30	41	14	15
Divorced/separated, no children	32	19	15	34
Divorced/separated, with children	28	35	9	28
Total Military Sample	37	25	15	23
Spouse Sample				
No children, member not deployed	23	23	21	33
No children, member deployed	19	23	29	29
Children, member not deployed	22	35	19	24
Children, member deployed	23	25	28	24
Total Spouse Sample	22	31	22	25

Table B-7

Analysis of Variance Summary: Coping Style and Marital/Parental Group Effects on Number of Personal Symptoms--Military Sample

Source of Variation	Mean Square	DF	F	Sig of F
	At Two Weeks			
Main Effects				
Coping Style	661.71	3	95.69	.000
Marital/parental group	18.71	5	2.71	.019
Interaction				
Group x Coping Style	12.28	15	1.78	.033
Residual (Error)	7.76	2480		
	At Seven Months			
Main Effects				
Coping Style	110.66	3	25.06	.000
Marital/parental group	.59	5	.13	.984
Interaction				
Group x Coping Style	7.67	15	1.74	.038
Residual (Error)	4.42	2480		

Note. Distributions for personal symptoms have been corrected to approximate normal distributions.

Table B-8

Analysis of Variance Summary: Coping Style and Parental/Deployment Group Effects on Number of Personal Symptoms--Spouse Sample

Source of Variation	Mean Square	DF	F	Sig of F
	At Two Weeks			
Main Effects				
Coping Style	141.18	3	19.59	.000
Parental/deployed group*	77.31	3	10.73	.000
Interaction				
Group x Coping Style	15.50	9	2.15	.024
Residual (Error)	7.21	757		
	At Seven Months			
Main Effects				
Coping Style	63.11	3	8.13	.000
Parental/deployed group*	48.30	3	6.27	.000
Interaction				
Group x Coping Style	3.42	9	.44	.913
Residual (Error)	7.76	757		

*Groups = Children/No Children by Spouse Deployed/Not Deployed.
Note. Distributions for personal symptoms have been corrected to approximate normal distributions.

Table B-9

Analysis of Variance Summary: Coping Style and Marital/Parental Group Effects on Family Problems--Military Sample

Source of Variation	Mean Square	DF	F	Sig of F
	At Two Weeks			
Main Effects				
Coping Style	33.48	3	10.04	.000
Marital/parental group	11.06	4	3.32	.010
Interaction				
Group x Coping Style	1.67	12	.50	.915
Residual (Error)	3.34	1513		
	At Seven Months			
Main Effects				
Coping Style	11.50	3	4.80	.002
Marital/parental group	5.20	4	2.17	.070
Interaction				
Group x Coping Style	.92	12	.38	.970
Residual (Error)	2.39	1513		

Notes.
1. Single (never married) members without children excluded from this analysis.
2. Distributions for family problems have been corrected to approximate normal distributions.

Table B-10

Analysis of Variance Summary: Coping Style and Parental/Deployment Group Effects on Family Problems--Spouse Sample

Source of Variation	Mean Square	DF	F	Sig of F
	At Two Weeks			
Main Effects				
Coping Style	27.47	3	5.66	.001
Parental/deployed group*	21.41	3	4.41	.004
Interaction				
Group x Coping Style	6.81	9	1.40	.182
Residual (Error)	4.85	757		
	At Seven Months			
Main Effects				
Coping Style	1.26	3	2.20	.086
Parental/deployed group*	5.55	3	9.75	.000
Interaction				
Group x Coping Style	.92	9	1.61	.107
Residual (Error)	.57	757		

*Groups = Children/No Children by Spouse Deployed/Not Deployed.
Note. Distributions for family problems have been corrected to approximate normal distributions.

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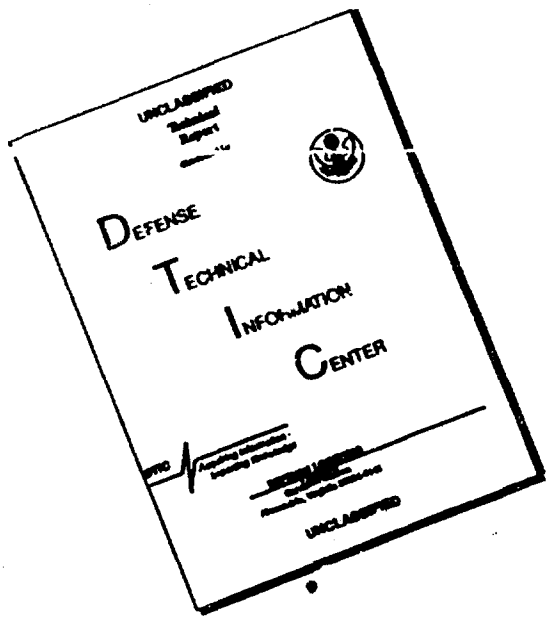

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